AGE AND YOUTH IN MEDICINE.

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I KNOW nothing more inspiring than a scene like the present. Before me is a company of young women and young men, recruits in the medical army, anxious to press forward to all the dangers, trials, failures, and successes of a medical life to final victory. My career will soon end while yours is just beginning. I look toward the western setting sun, you greet the eastern rising sun. Mine is the past with its splendid accomplishments, its dismal failures, its disheartening, unaccomplished tasks. Yours is the golden future, yours to renew the attack where we have failed and to win the battles that we have lost, yours to fulfil our unaccomplished tasks. Naturally, therefore, the occasion suggests a contrast between myself and yourselves, and, accordingly, I have taken as my topic "Age and Youth in Medicine."

Let me recount briefly some of the wonderful things that I have seen accomplished in the more than three-score years covered by my own life and then glance at what may be in store for you.

First, the geographical and political changes I have seen have been almost kaleidoscopic in their variety and extent.

The map of Europe has been remade. Since 1859, the year that I graduated from the University, Italy has been re-created as a united

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Kingdom. This new political life has been followed by a wonderful intellectual revival, so that Italian medical science and letters to-day have won an enviable place. Austria has lost her Italian possessions and has been deposed from her Teutonic hegemony. Germany has been created by the welding of two-score states into one imposing Imperial Power. Spain, one of Lord Salisbury's "dying nations," has lost her colonies and her prestige. France has been shorn of Alsace and Lorraine. The Danubian Principalities have taken the first steps toward freedom from the rule of the "unspeakable Turk," the one foul blot still existing on the map of Europe.

The map of Africa has been drawn anew since my boyhood. The "terra incognita" which well described central Africa when I first studied geography, has been explored, and Stanley, its foremost explorer, lies in a new-made grave. The sources of the Nile have been found; the Mountains of the Moon have disappeared. Egypt has been renovated by Anglo-Saxon genius. The boundless resources of tropical Africa have aroused the earth, hunger of European nations until nearly the whole of it has been parcelled out among them. A railroad will shortly connect Cairo and the Cape, and modern steamers will soon ply upon every great river of the Dark Continent.

The old map of Asia has been torn in pieces by Russia. Step by step, stealthily, yet steadily, she has encroached upon the various predatory nations of Asia and has made herself master of one after another until it seemed as though everything north of the Himalayas would fall into her capacious maw. But the new map of Asia is now in the making, and in its reconstruction, Japan, thank God, will have much to say; Japan, that wonderful country, which only emerged from feudal seclusion as I was just

approaching middle life and entered upon the most remarkable career of national development ever witnessed in historic time.

And, what shall I say of America? True, its boundaries had been enlarged a century ago, but it was still only a vast virgin wilderness, over which roamed the bison, the bear, the Indian, and a few adventurous trappers. In my young manhood Indian wars were of more than annual occurrence, and practically the whole of our little army occupied frontier forts, which now are centers of a busy civilization. The "prairie schooner," slowly creeping across the plains, faintly presaged the Pacific railroads; Chicago was Fort Dearborn when I was born; St. Paul was a village and Minneapolis was a name yet uncoined when I graduated from Brown University; Texas, California, and Alaska were all added in my early years, and even you have seen Hawaii, Porto Rico, and the Philippines become possessions of the Great American Republic.

In the arts and sciences that minister to the progress and comfort of man, the changes have been equally rapid and widespread. The railroad and the steamboat were just at the beginning of their marvelous development when I was born. No human face had yet been fixed by the complaisant sun on the plate of the daguerreotype, the ambrotype, or the photograph. The scythe has been replaced by mowing- and reaping-machines; type-setting and printing were done by hand instead of type-setting machines and the swift Hoe printing press. In my childhood days the rag-picker was a familiar figure on the streets, hooking over the piles of waste to find the linen rags from which paper was made, and paper, therefore, was very costly. Now, our forests are ground into paper and the modern penny newspaper has been born. I shall never forget my father's incredulity

when he first read of a machine which would do the work of a woman's deft fingers, but the American sewing machine has conquered the world.

In my boyhood, electricity was scarcely known outside of the laboratory. Its marvelous multitudinous uses, to-day barely at the beginning of their development, were utterly unknown. The first commercial telegraphic message was sent in the very year of my birth—now it is one of the daily needs of millions. Its omnipresent wires have scaled mountains, burrowed under the slime of the sea, girdled the earth, and put Puck to shame as a lagging messenger. Even in late years, the telephone, the trolley, the dynamo, the electric lamp, and wireless telegraphy have all sprung into being as by magic and soon all of our rivers will be harnessed and made subservient to the comfort of mankind.

The human hand, that most perfect instrument, has been almost driven out of the industrial market by various machines which do its work so much more cheaply and often so much better. Metallurgical processes have so cheapened the production of iron, copper, aluminum, and other metals that whereas a few years ago their use was impossible on account of their cost, they are now common household implements.

When I was in college, the so-called Fraunhofer lines were simply a curious phenomenon in the solar spectrum; yet, a few years later, they furnished us with a chemical analysis not only of the sun, but of far distant comets and nebulæ, and have determined even the velocity of light from the furthest confines of the universe. Nay, more, by means of the spectroscope elements unknown on the earth have been discovered in the sun; and now that by its means we have discovered helium and know that uranium becomes changed into radium and radium into helium, one element into

another, the asserted philosopher's stone of Paracelsus and the other alchemists, by which they could transform the baser metals into gold, may possibly be found to be of more substantial stuff than dreams are made of.

Meanwhile educational endowments of millions have been made. Philanthropy cares for the children, the prisoner, the degenerate, and even the lower animals; slavery has been abolished; the International Tribunal of Arbitration will soon be housed in a palace dedicated to Peace and erected by an American, and religious liberty is enjoyed as never before.

But, with all this wonderful progress, where has medicine been? Has it kept step with the other arts and sciences or has it lagged behind? It delights me to say that it has not only kept up with the foremost rank, but has even outstripped not a few. In 1846 and 1847 ether and chloroform were discovered and the operating table was robbed of well-nigh all its terrors. Thirty years later, thanks to Lister, antisepsis added its benison to the blessing of anæthesia, and operations have been deprived of nearly all their pain and of their former frightful mortality. These two blessings, the one making operations painless, the other making recovery almost certain, have made possible a new surgery which was not only impossible but even undreamed of when I began to study medicine. In this way have been developed the surgery of the kidney, of the liver, of the gall-bladder, of the pancreas, of the stomach, of the intestines, of the appendix, of the prostate, of the brain, of hernia, of the pelvic organs, and even of the heart. By these means the mortality of compound fractures and of ovariotomy, which used to claim two out of every three patients, is now reduced almost to a vanishing point. In fact, were my old teachers of surgery,

Gross and Pancoast, to come to life, they could not even understand our modern vocabulary; and if they were to visit a modern surgical clinic, they would think us stark mad.

Moreover, we have blocked many diseases at the fountain-head by discovering their causes and the means by which they become diffused among the well. Thus we have found that the guilty culprit spreading yellow fever and malaria is the mosquito, and that the cause of malaria is a parasite whose life history is now perfectly known. The efficiency of our means for preventing outbreaks of both of these scourges of the human race will find a splendid illustration within the next few years in the sanitation of the Isthmus of Panama, which will be Chapter II in the splendid volume, whose first chapter was written in Cuba by Major Walter Reed of the United States Army. The cause of the plague and its dissemination by the rat is well known; the cause of typhoid fever and its dissemination by flies and through drinking water, and of cholera and its diffusion through drinking water, are also matters of popular knowledge. We know now the deadly cause of diphtheria, and the use of its antitoxin is making the once loud wail of parents for their lost little ones as after the death of the first-born in Egypt to grow fainter and fainter. The prevention of smallpox has been known for a century, and lately its cause has been found by an Italian and an American. The causes of cancer, of scarlet fever, of measles, and of many other of the commoner diseases of childhood, have as yet eluded the scrutiny of the ablest men of the profession. The discovery of these is among the unfulfilled tasks to which I referred a few moments ago, which is committed to your hands.

Microscopical analysis and the chemistry of the secretions have been wholly rewritten within the

past quarter of a century, while the examination of the blood as a means of diagnosis and the serum treatment of disease have made splendid beginnings. Percussion and auscultation have opened a new world to us in the diagnosis of diseases of the chest and abdomen.

Meantime numerous instruments have been added to our armamentarium, without which the modern physician and surgeon would be almost helpless. The thermometer, which has only been our handmaid for about thirty years, has substituted exactness for surmise; the hypodermatic syringe disclosed a new method of medication about the same time; the aspirator was not known till after I graduated in medicine; the ophthalmoscope has revealed an unknown world in the interior of the eye, which, with many other instruments of precision, has made ophthalmology one of the most exact of the medical sciences and a model of accurate measurement and statement for all its sister sciences. The otoscope, rhinoscope, cystoscope, œsophagoscope, and other similar instruments have revealed to us the interior of other organs of the body in a way formerly wholly unknown, while the simple hæmostatic forceps and retractors have made many modern operations physically possible.

The growth of medical laboratories within the last twenty-five years has been phenomenal. The laboratory has done much more than merely afford the opportunity for investigations which have yielded such an abundant fruit. It has cultivated laboratory methods—that is to say, methods of exactness, and the use of instruments of precision. The experimental method in medicine has done more than any other one thing to widen the boundaries of our knowledge. Besides this, it has cultivated precision in thinking, which is more important than any instrument or method. The vague theories and

subtle reasoning of our forefathers are now replaced by exact methods of investigation. The difference is well set forth by Mumford when writing of Rush and the yellow fever. "Like the rest of the profession," says he, "Rush was at his wits' end, and it is interesting to note how different from modern methods were the means adopted by such men for solving the problem of treatment. In these days the natural history of a disease is worked up, its pathological anatomy investigated, and clinical and laboratory researches elaborately and carefully made in order to learn the exact nature of the phenomena under discussion and so, perchance, to find an appropriate and rational remedy. Those ancient men, on the contrary, had their preconceived notions as to the nature of the disease, and limited themselves mainly to searching the literature of the subject and to experimenting with drugs." Reasoning about the yellow fever and its effects, Rush "thought he saw that the debility indicated by the low pulse was due to the 'oppressed state of the system' [whatever that may mean] which must be relieved by purging, supplemented by bleeding."

Imagine, if you can, the forlorn condition of the doctor sixty years ago without our present means for physical diagnosis, without the thermometer, the hypodermatic syringe, the various specula and other instruments I have named, without the aid of hæmatology, of anæsthetics, of antisepsis, of the modern microscope, without our laboratories, and our experiments, our chemistry, our bacteriology and our antitoxins—without everything except his eyes, his ears, and his fingers: then you can appreciate the triumphal march of medicine during a single lifetime.

In this brief review I have given you, very hastily and imperfectly, something of what has been done

in medicine during my own lifetime. What, now, has the future in store for you?

You entered the medical school in vastly different conditions from those which obtained when I began the often weary study of Gray, Gross, Watson, and Ramsbotham. I am often reminded of the time when the Chief Captain rescued St. Paul from the mob, and asked him whether he were a Roman citizen. When the Apostle declared that he was, "With a great sum obtained I this freedom," said the Chief Captain; to which his Hebrew captive proudly answered, "But I was born free." You, too, are "born free"; born to an inheritance of anæsthesia, of antisepsis, of laboratories, of improved methods of teaching, of many heretofore unknown drugs. "With a great sum" of toil, and work, and worry the men of my generation have obtained the freedom which you have inherited.

What use will you make of this freedom? First, you will improve, I trust, on our present laboratory methods and our present methods of teaching. Pathology, a feeble aid to medicine and surgery when I began my medical studies in 1860, and bacteriology, a word found in no lexicon of that date, have become veritable foundations of the medical curriculum even since I began to teach. You, in your turn, must develop other and at present equally unsuspected sources of knowledge. You will introduce new instruments of precision, new means of investigation, and will thus be able to defeat, and, still better, to prevent disease. The men who will make the most progress in the next generation will be the physiological physicians and surgeons, those who are best acquainted with chemistry and physics, and who will investigate the blood, the secretions, and the tissues in present ways more perfectly developed, and in new ways of which now we cannot even guess the method

or the object. Leucocytosis, iodophilia, cytodiagnosis, cryoscopy, blood pressure—all these you will use and improve upon far more than I dare picture. Comparative pathology will enrich and broaden your views. Possibly the original suggestion of Sir Christopher Wren, of intravenous medication, which we practise to but a small degree to-day by infusions of salt solution and of adrenalin, may become one of the recognized avenues for the administration of remedies. The ultramicroscopic vision which has just been conferred upon us, by which minute particles far beyond observation with our ordinary microscopes have been made visible, has opened up a new world for investigation which may develop truths as yet unsuspected.

Ten years ago who would have believed that it would be possible to look through skin and flesh, bandages and splints as though they were not, and to see our bones and determine their state of health or disease, of fracture, or integrity; and yet to-day this is known to every layman. Radioactivity, and possibly new means for the employment of light, may open new avenues for treatment. Certain it is that your studies in immunity, in toxins, and antitoxins will give you new weapons by which to prevent or vanquish disease and confer health. We need a new and safe anæsthetic. We need new drugs, new instruments of precision, by which new properties of matter, and novel methods of physical diagnosis shall be discovered, and the beneficence of medicine illustrated by unexpected and, to-day, impossible methods of cure. In these researches, alas, I shall take no part, but I can at least goad you on to their accomplishment.

But I must not forget that I am speaking to American graduates in medicine. When I was a young man, every young graduate who could af-

ford the time and expense went to Europe to put the finishing touches to his medical education. But the current is turning westward, and will enable us ere long to repay the great debt we owe to our European brethren by freely sharing with them our future wealth of scientific and practical knowledge and experience. We have awakened to a new life of research in the laboratories founded by liberal citizens—and no institution has more reason to be proud of a generous patron than Cornell—we have felt a new intellectual impulse in our colleges—our physicians and surgeons are alert and progressive as never before. Coincident with a great political expansion that has carried us half way around the globe, with a commercial expansion which has made the world stand amazed at what we have accomplished—if the experience of England under Elizabeth, of Italy under Victor Emmanuel, of Germany under two Kaisers is any guide—there will surely be in America an equal intellectual and scientific expansion. The future belongs to America—it belongs to you—if you but show yourselves worthy of the great inheritance to which you are heirs, and of the splendid possibilities which medicine offers you with lavish hand. You will be unworthy children of worthy sires if you do not rise to the level of these opportunities. Shall it be said that our statesmen, our merchants. and our manufacturers are abler, more enterprising, more conquering than our scientists, our surgeons, and our physicians? Nay, verily. You, new members of our own profession will assuredly prove yourselves equal to the mighty task set before you, and conquer the world by being its noblest, wisest, and most unselfish benefactors.